

1 trays or bins, with output from different copy jobs being sent to different trays.
2 In addition to copiers, printers may also be provided with a plurality of output
3 trays or bins. In particular, networked printers that are shared by multiple users
4 typically have multiple output trays. Each networked user directs the output
5 from his print job to a desired tray or bin, or may even have an assigned output
6 tray or bin. This allows the multiple users to easily separate and identify their
7 output.

8 Some existing copiers and printers are capable of evenly distributing
9 output from a job between a plurality of trays in a collated manner. That is, it
10 is known to collate output copies to form multi-page documents by depositing a
11 copy of a first page of a multi-page original document in each of a plurality of
12 output receptacles. A copy of the second page of the original is then copied
13 and deposited into each of the output receptacles. This process continues until
14 a complete set of all the pages of the original document is in corresponding
15 number of the output receptacles. Other collating methods are known. For
16 example, it is known to produce collated output documents by depositing a
17 complete multi-page document in a first output receptacle, depositing a second
18 complete multi-page document in a second output receptacle, depositing a third
19 complete document in a third receptacle, and so on, until the desired number of
20 complete copies of the original have been produced.

21 The prior art also includes a number of patents broadly dealing with
22 document delivery to trays of document production apparatuses. By way of
23 example, US Patent No. 5,697,761 for "Mailbox Bin Job Set Extractor"
24 assigned to Xerox Corp. describes a dynamic mailboxing unit for separating
25 job output from different users for a shared printer. Published Japanese
26 Application No. 08209674 (Publication No. 10053338 JP; applicant Fuji Xerox
27 Corp.) for "Tray Selecting Device of Multi-Tray" describes multi-tray
28 distribution of documents based on paper size. US Patent No. 5,982,510 for
29 "Information Recording Device which Selects Paper Tray and Shifts Output
30 According to Received Image Data or Source" assigned to Brother Kogyo
31 Kabushiki Kaisha describes an apparatus for delivering produced documents to

1 different output trays depending on what kind of information is recorded on the
2 document. US Patent No. 4,466,608 for a "Movable Tray Sheet Sorter"
3 assigned to Gradel Systems, Inc. describes an apparatus having a plurality of
4 sorting bins for manually and individually sorting and collating output
5 documents.

6 The teaching of these patents, as well as all other known document
7 production apparatuses, however, leave many problems in the art unresolved.
8 Many copier users, for instance, are faced with the task of creating unmatched
9 sets of printed output, such as may be required for differing distribution sets.
10 By way of example, a user may wish to distribute thirteen copies of an original
11 to a first work group, four copies to a second work group, nine copies to a third
12 work group, sixty seven copies to a fourth work group, and twenty one copies
13 to a fifth work group. The only known method for accomplishing these results
14 would be to execute separate copy jobs for each work group, or to execute one
15 large copy job and then manually subdivide each of the respective work group
16 copies in required numbers in subsequent steps. Executing separate copy jobs
17 or manually separating an aggregate job is not practical when the required
18 number of distribution sets becomes large.

19 Similar problems exist for printer users. While the printing of multiple
20 copies has been limited in the past due to the generally higher cost of a printed
21 page as compared to a photocopied page, technological advances have made
22 the printing of multiple copies cost competitive to copying. The result is that
23 many modern printer users utilize a printer to produce multiple copies of
24 documents. At times, a user may wish to print differing numbers of copies for
25 differing distribution. By way of example, a printer user may wish to print
26 multiple documents for the above example distribution list: thirteen copies of
27 an original to a first work group, four copies to a second work group, nine
28 copies to a third work group, sixty seven copies to a fourth work group, and
29 twenty one copies to a fifth work group. Presently known printers can achieve
30 this result only by executing multiple print jobs, or by printing a single
31 aggregate job and then manually dividing the output into the desired sets.

These and other problems remain heretofore unresolved in the art.

Summary of the Invention

The present invention is directed to an improved document production apparatus having a distribution control module for selectively creating a plurality of subsets of job output from execution of a single document production job. The distribution control module selectively directs each of the subsets to different output receptacles provided with the apparatus. Preferably, the number of documents to place in each of the output subsets and the destination output receptacle for each subset are specified by a user. Preferred embodiments of the document production apparatus of the invention comprise printers and copiers.

As will be appreciated by those knowledgeable in the art, the present invention also lends itself well to practice in the form of a computer program product. Accordingly, an additional embodiment of the present invention comprises a computer program product for selectively distributing the output of a copy job to a plurality of output receptacles in selected quantities.

Through practice of the invention, a user is advantageously able to execute a single document production job and to create output subsets having differing numbers of documents to be deposited in different output receptacles. By way of example, a user may within a single copy job create four output subsets to be deposited in four different trays. A first of the subsets may have five copies and be directed to a first tray, a second subset of six copies directed to a second tray, a third subset of seventy copies directed to a third tray, and a fourth subset of thirteen copies directed to a fourth tray.

The above brief description sets forth rather broadly the more important features and advantages of the present disclosure so that the detailed description that follows may be better understood, and so that the present contributions to the art may be better appreciated. There are, of course, additional features of the disclosure that will be described hereinafter that form the subject matter of the claims appended hereto. In this respect, before

1 explaining the embodiment of the disclosure in detail, it is to be understood that
2 the disclosure is not limited to the construction or arrangements set forth in the
3 following description or in the drawings. The present invention may provide
4 additional embodiments, as will be appreciated by those skilled in the art.
5 Also, it is to be understood that the phraseology and terminology employed
6 herein are for description and not limitation.

Brief Description of the Figures

9 FIG. 1 is a schematic diagram of a copier embodiment of the apparatus
10 of the invention.

11 FIG. 2 is a schematic diagram of a printer embodiment of the apparatus
12 of the invention connected to a plurality of networked computers.

13 FIG. 3 is a flow chart illustrating a computer program embodiment of
14 the invention.

Detailed Description

Turning now to the drawings, FIG. 1 is a schematic diagram of one copier apparatus embodiment of the invention. The copier 2 is for executing so called "copy jobs", which comprise the reproduction of an image from an original document 4 onto a plurality of copies (not illustrated). The resultant plurality of copies is referred to herein as "copy job output". That is, as used herein a "copy job" refers to a process of reproducing an image from at least one original document onto "copy job output" that comprises a plurality of documents each having a reproduction of the image. A copy job may comprise the reproduction of a document comprised of only a single page to produce a plurality of copies, or may comprise the copying of a multi-page document to produce a plurality of copies of the entire multi-page document.

The copier 2 is provided with a plurality of output receptacles for receiving the copy job output, with preferred receptacles comprising trays 6. It will be appreciated that output receptacles may comprise many different forms than the preferred trays 6. Indeed, it will be appreciated that as used herein the

1 term “output receptacle” is intended to refer to a device for receiving copy job
2 output. Other examples of output receptacles include, but are not limited to,
3 bins, boxes, slots, shelves, virtual mailboxes or trays, and the like.

4 Importantly, the copier 2 also comprises an output distribution module
5 8. The output distribution module 8 is linked to a user accessible operating
6 interface 10 provided with the copier, with the linkage 12 illustrated in FIG. 1
7 as a dashed line. The operating interface 10 is for at least partially controlling
8 the copier 2, and preferably comprises at least a display and a plurality of
9 selection means such as buttons or the like. The linkage 12 may comprise any
10 number of functional connections for providing communication between the
11 operating interface 10 and the distribution module 8, with examples including
12 but not limited to wiring, circuitry embedded on a card or chip, wireless
13 connection means, and the like. Also, it will be appreciated that the operating
14 interface 10 may be external to the copier 2, and may for instance comprise a
15 processor-based controller operating interface located remotely from the copier
16 2.

17 The distribution module 8 is for selectively creating a plurality of output
18 subsets from execution of a single copy job, and for selectively directing the
19 subsets to deposit in different trays 6. The number of copies to be placed in
20 each of the output subsets is specified by the user through entry of a subset
21 quantity selector value through the operating interface 10. Likewise, the
22 particular tray 6 to direct each output subset can be specified through entry of a
23 subset tray selector. Preferably, these selector values may be entered in a
24 tabular or table format through the operating interface 10. It is noted that as
25 used herein the terms “tray selector” and “receptacle selector” are intended to
be synonymous.

27 The distribution module 8 has been illustrated in FIG. 1 as a “box”. In
28 practice it will be appreciated that the module 8 may comprise any of several
29 physical embodiments. By way of example, the distribution module 8 may
30 comprise an electrical circuit for receiving instruction from the interface 10 and
31 for causing mechanical paper handling means within the copier 2 to create and

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1 distribute the output subsets as instructed. The circuitry may be integrated
2 circuitry on a medium such as a circuit board or card, chip or chipset, or the
3 like.

4 By way of additional example, the copier 2 may be the type that
5 comprises a processor, and the distribution module 8 may comprise processor
6 executable instructions embedded in a processor-readable medium such as a
7 magnetic, optical, or other memory device. The processor in the copier 2 may
8 then execute those instructions upon reception of a prompt from the interface
9 10, with the result that the instructions cause mechanical paper handling means
10 within the copier 2 to create and distribute the output subsets as instructed.

11 Additionally, it will be appreciated that the control module 8 may
12 comprise a component of the copier 2, or may even comprise a subcomponent
13 of a component of the copier 2. For example, the module 8 may comprise a
14 subcomponent of the operating interface 10, or may comprise a subcomponent
15 of a paper handling mechanism within the copier 2. Further, although
16 illustrated as a single box, the control module 8 may comprise a plurality of
17 individual functional components that may be physically separated from one
18 another in the copier 2. A component of the control module 8, for instance,
19 may comprise mechanical paper handling means within the “paper-handling
20 engine” of the copier 2, with a second component comprising programmable
21 instructions embedded in an operating interface memory module.

22 In addition to a copier, the document production apparatus of the
23 invention may take the form of any of a number of additional embodiments. In
24 particular, a second preferred embodiment comprises a printer. Accordingly,
25 FIG. 2 illustrates a schematic of a printer 50 connected to a network 52, with a
26 plurality of computers 54 connected to the network 52. The printer 50
27 comprises a plurality of output receptacles in the form of the preferred trays 56.
28 It will be appreciated that a configuration as illustrated in FIG. 2 is of utility for
29 sharing a printer between a plurality of users. In particular, each of the trays 56
30 preferably has a unique identifier associated with it that users from any of the
31 computers 54 may use to direct print job output.

1 Unlike printers of the prior art, the printer 50 of the invention comprises
2 a distribution control module 58 for selectively creating a plurality of job
3 output subsets from a single print job, and for selectively directing the subsets
4 to the output trays 56. The number of copies to be placed in each of the
5 plurality of output subsets is determined by a user-specified subset quantity
6 value. Likewise, the particular output tray 56 to direct each of the output
7 subsets to is specified by a user-specified subset receptacle selection.

8 Thus, with the printer of the invention a user is able to execute a single
9 print job and specify that a plurality of subsets be created within the print job
10 output with each of the subsets comprised of a desired number of documents.
11 Further, the user is able to specify which of the plurality of trays 56 each subset
12 should be directed to.

13 The output distribution control module 58 has been illustrated in FIG. 2
14 as a "box" within the printer 50. As will be appreciated by those
15 knowledgeable in the art, this representation of the control module 58 has been
16 made for illustration purposes only. The output control module 58 in practice
17 may comprise any of several embodiments, some of which reside in the printer
18 50, some of which reside elsewhere such as in any of the computers 54 or any
19 other computer device that may be additionally connected to the network 52.
20 Further, the control module 58 in practice may comprise a combination of
21 some functional elements residing in the printer 50 and some in one or more of
22 the computers 54. For example, a portion of the control module 58 may be a
23 sub-component of a "printer engine".

24 It is noted that conventional document handling "engines" for document
25 production apparatuses such as printers, facsimile machines, and copiers are
26 generally known in the art. In particular, those knowledgeable in the art will
27 appreciate that a "document handling engine" may comprise processor
28 controlled systems that respond to simple programmed commands and/or
29 conventional electrical switch means to actuate cooperating gates, arms,
30 fingers, motors, clutches, belts, rollers, solenoids, sensors, and the like. These
31 document engine components work in combination to move sheets from a

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1 feeder supply, route the sheet along the sheet path into position for receiving an
2 image thereon, and route the sheet to an output receptacle. Because document-
3 handling engines as such are generally known, they are not discussed in detail
4 herein. For additional disclosure, reference is made to US Patent No.
5 5,982,510 to Funahashi, herein incorporated by reference, which teaches one
6 embodiment of a document-handling engine.

7 A preferred embodiment of the output control module 58 for use with a
8 printer comprises a printer driver running on any of the computers 54 for
9 functional interface between the computer 54 and the printer 50. In this
10 preferred printer driver embodiment, the subset quantity selector and the subset
11 receptacle selector values are entered through a graphic user interface ("GUI")
12 running on the computer 54. As used herein, the term GUI is intended to refer
13 to an interface display shown on a screen that comprises a plurality of data
14 fields for entry of data by a user.

15 Most preferably, a tabular or table interface is provided for entry of the
16 respective subset quantity and receptacle values. As used herein, the terms
17 "tabular" and "table" are intended to refer to an arrangement of columns and
18 rows for data entry. It has been found that such a format provides for
19 convenient and organized data entry with practice of the invention, particularly
20 when a multiplicity of subsets is to be created and distributed. By way of
21 example, Table 1 is an example table format that may comprise a portion of the
22 preferred printer driver of the invention:

Print Job Subset Distribution Selections	
Subset Tray Selector:	Subset Quantity Selector:
Tray 1	34
Tray 2	65
Tray 3	21
Tray 4	5
Tray 5	124

1 Thus, with the subset quantity selector and subset receptacle selector specified
2 as above in TABLE 1, 34 copies within the copy job will be directed to the tray
3 56 identified as Tray 1, 65 copies within the copy job will be directed to Tray
4 2, 21 copies within the copy job will be directed to Tray 3, 5 copies to Tray 4,
5 and 124 copies to Tray 5.

6 The number of subsets created will preferably correspond to the number
7 of selector values that are input. That is, if a user enters three sets of subset
8 quantity and tray selector values, three output sets will be created. Likewise, if
9 a user enters one hundred sixty subset tray and quantity selector sets, one
10 hundred sixty output sets will be created. Other means for determining how
11 many output subsets to create could of course be provided within the invention.
12 For example, an additional variable could be entered that comprised a total
13 number of subsets to be created. It will be appreciated that there is no practical
14 limit to the number of output subsets to create within practice of the invention,
15 and that the number of subsets referred to herein is for purpose of example
16 only.

17 In addition, it will be appreciated that a wide variety of tray identifiers
18 may be used in addition to those described herein. Indeed, it may be most
19 practical to identify trays or other receptacles with names associated with an
20 ultimate destination for the output deposited therein. For example, trays may
21 be identified by workgroups, such as Accounting, Administration, Human
22 Resources, Engineering, and the like.

23 It will also be appreciated that the present invention lends itself well to
24 practice in the form of a computer program product. Accordingly, an
25 additional embodiment of the present invention comprises a computer program
26 product for use with a document production apparatus, with the computer
27 program product comprising computer executable instructions embedded in a
28 computer readable medium. FIG. 3 is a flow chart illustrating one embodiment
29 of the computer program product of the invention.

30 When executed the program instructions cause the apparatus to accept
31 input subset quantity selections (100) and input subset receptacle selections

1 (102). These selections are preferably input through a GUI in a table format
2 (104). Individual selections may be input by typing of individual characters, or
3 more preferably by choosing from a pre-defined set of choices by scrolling or
4 the like. Each cell of a table, for instance, may have a scroll bar associated
5 with it that allows for choosing from a number of pre-defined variable options.

6 The preferred GUI interface may be displayed for manipulation by a
7 user in any of a number of manners and locations. If the document production
8 apparatus comprises a printer, for example, a GUI interface may comprise an
9 input/output screen displayed on a computer attached to the printer. The
10 printer may be directly connected to the computer, or may be remotely
11 connected via a network. Should the document production apparatus comprise
12 a copier, the preferred GUI may comprise a display on an LCD or other screen
13 comprising the copier-operating interface. The display screen and/or the
14 operating interface may comprise switch means for entering data, such as scroll
15 buttons, a keypad, a touch screen, or the like.

16 After accepting input selector values, the program instructions then
17 cause the apparatus to create a plurality of output subsets from the execution of
18 a single document production job (106). The subsets are created corresponding
19 to the input selection values, so that a subset is created with the number of
20 documents as specified by every one of the input quantity selections. By way
21 of example, if three sets of input selector values were accepted with subset
22 quantity values of 10, 25, and 35, then three corresponding output subsets
23 would be created having 10, 25, and 35 documents therein. Likewise, the
24 computer program product will cause the created output subsets to be
25 distributed to output trays according to the tray selector values.

26 It will be appreciated that the computer program product embodiment of
27 the invention may take any of several functional and/or physical forms. By
28 way of example, the program product may comprise instructions for execution
29 by a processor in a copier apparatus. In this case the instructions may be
30 embedded in a memory module such as a magnetic or optical means in the
31 copier, or external memory means to be input and read by the copier such as a

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1 portable disk. The program product may likewise be embedded on RAM,
2 ROM, flash memory module, or the like in the copier. Additionally, the
3 program instructions may comprise integrated circuitry on a chip or chipset in
4 the copier.

5 Also, the computer program embodiment of the invention may take the
6 form of a printer driver, or a component thereof, running on a computer
7 attached to the document production apparatus. As used herein, the term
8 “driver” is intended to refer to a computer program for functional interface with
9 connected hardware. Most printers for use with computers require drivers, and
10 some copy machines are connected to a computer that requires a driver for
11 operation of the copier. It will be appreciated that the program product of the
12 invention may be efficiently combined with existing drivers, as these programs
13 may be required for using the apparatus and must therefore be obtained and
14 loaded by apparatus users. No additional effort is thereby required to obtain
15 and load the program product of the invention when it is combined with a
16 driver.

17 When combined with an apparatus driver, the preferred GUI of the
18 program product of the invention may comprise a screen within a plurality of
19 apparatus set-up screens. By way of example, when using the Windows
20 operating system from Microsoft Corp., Redmond, WA, printing of documents
21 from applications such as word processors with an installed printer allows for
22 access to and manipulation of various printer “properties”. A user may be able
23 to access a GUI printer menu that allows for adjustment of such items as type
24 of paper, choice of printer, number of copies, quality of graphics, and the like.

25 A preferred computer program product embodiment will be accessible to
26 the user through a part of such a GUI menu. An additional “tab” or similar
27 selector on a “properties”, “printer” or similar menu may provide a table
28 interface for entering numbers of output subsets, quantity of documents to
29 place in respective subsets, and trays to output respective subsets to. Reference
30 to Table 1 herein is made by way of example.

1 Using any of the various embodiments of the apparatus or program of
2 the invention, users are able to execute a single document production job that
3 results in the creation of a plurality of subsets within the production job, with
4 the subsets able to be comprised of different numbers of copies. Additionally,
5 the subsets can be distributed to different output receptacles for convenience of
6 handling.

7 The various embodiments and examples described herein are
8 representative of the known best modes of practicing the invention only, and
9 should not be interpreted to limit the scope of the invention. Those skilled in
10 the art will appreciate that many variations on the embodiments can easily be
11 made within the scope of the invention as claimed. By way of example,
12 although invention embodiments comprising a printer, a copier, and a program
13 product have been described herein, it will be understood that the invention
14 may take other embodiments including, but not limited to, document
15 production apparatuses such as a facsimile ("fax") machine, a scanner,
16 combination printers/copiers/scanners and the like. By way of additional
17 example, the sequence of program or apparatus operations may be easily
18 changed from that described herein. Additionally, the apparatus of the
19 invention may comprise any number of document production apparatuses in
20 addition to a copier and printer as described.

21 By way of still further example, reference herein to "documents" is not
22 intended to limit the practice of the present invention to paper. Indeed, as used
23 herein the term "document" is intended to have its broadest possible
24 interpretation, and may comprise virtually any medium capable of receiving a
25 reproduced image thereon. Examples include, but are not limited to, papers;
26 polyethylene, polycarbonate, polystyrene or other synthetic sheets; metal
27 sheets, and the like.

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